" THE CAVITY" is a new technique and a new curriculum, "THE CAVITY" depends on the marine waters only to produce thermal and electrical energy With very high efficiency .

Presentation of water-desalinating plant

1. Preamble

Desalination of water for industrial and domestic use is carried out on desalinating plants. Depending on the method used power inputs per cubic meter range from 0.7 kW to 20 kW (2,5–72 MJ). (Hand-book of necessary knowledge)

2. Market of seawater desalination technologies

Over the past 40 years, the volume of fresh water per each person in the world has decreased by 60%. Lack of fresh water to the present moment experience more than 80 countries worldwide, mainly in the arid and dried areas and about 60% of the total Earth's land surface.

Problem

One-third of the world's population lives in countries with tense situation with water. According to experts forecasts, by 2025 this index will increase to two-thirds.

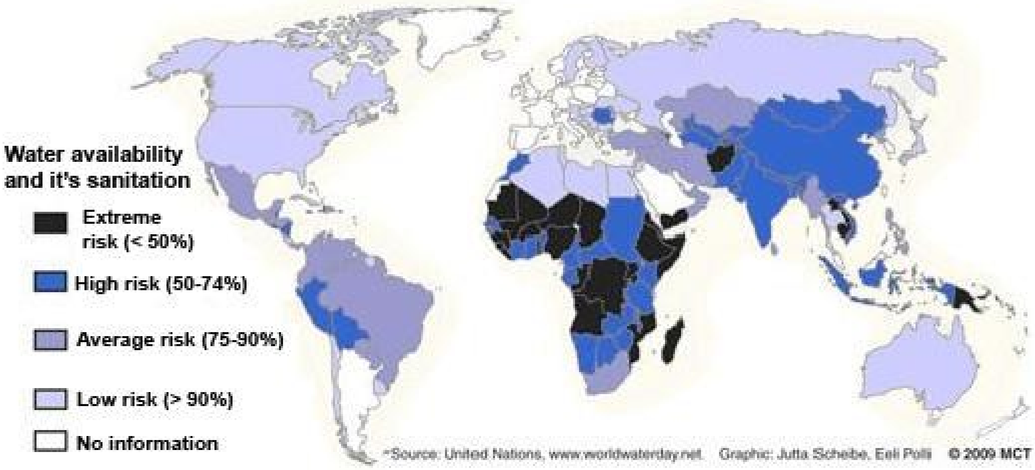


Fig.1 Global situation with water on the earth

The crisis will be triggered by the growth of the world population. The U.N.O estimates that by 2030 it will have been increased from 6 to 8.5 billion people. At present it is spent annually 2.5-3 thousands liters of water for food supply of one person, which has traditional industrially advanced countries ration. If population increase by 2.5 billion, then they need to find 2 thousand. cu. km of water additionally for sustenance.

In such conditions of freshwater critical shortage gain exceptional urgency alternative technologies of water resources replenishment, including desalination of seawater.

Water supplies

The total amount of water on the Earth is about 1.4 billion cubic meters. km, from which only 2.5% (about 35 million cubic meters. km) is freshwater. The seawater makes up about 98% of all water resources in the world.

Table 1. The largest power supplies in the world (source: www.unep.org)

Water type	Volume of reserves, thous. km^3	Portion in general water supply, %	Portion in general sweet water supply, %
Salt water			
Oceans	1 338 000	96.54	
Salt/brackish underground waters	12 870	0.93	
Salt water lakes	85	0.006	
Land waters			
Glaciers, constant blanket of snow	24 064	1.74	68.70
Sweet underground waters	10 530	0.76	30.06
Underground ice, permafrost	300	0.022	0.86
Freshwater lakes	91	0.007	0.26
Soil moisture	16.5	0.001	0.05
Water vapor in atmosphere	12.9	0.001	0.04
Swamps, overmoistened territories	11.5	0.001	0.03
Rivers	2.12	0.0002	0.006
Moisture of live organisms	1.12	0.0001	0.003
General water supplies	**1 386 000**	**100**	
Sweet water general supplies	**35 029**		**100**

One of the most promising ways of freshwater providing is desalination of World Ocean's salt water. The advisability of this way is confirmed by the fact that 60% of the world's population lives in the coastal zone 65 miles wide. In addition large areas of arid and shallow areas adjoin to the ocean's shores, or are close to them.

Thus, ocean and sea water can be a valuable source of water resources for industrial use. Their vast reserves are practically inexhaustible. However, at the level of

technological development the use of desalination technologies is not everywhere economically justified.

Market

By the end of 2009 in the world it has been represented 14,451 water-desalinating plants total capacity of 59.9 million cubic meters. m per day. In comparison with 2008 capacity increase was 12.3%. In addition, 244 desalination plants (optional 9.1 million cu. M per day) are under construction.

Totally seawater desalination technology are used in more than 150 countries. The average volume water production is about 38 million tons per year.

Salt water desalination technologies market is growing rapidly. Around 62.4% of sweet water total industrial production are World Ocean's waters.

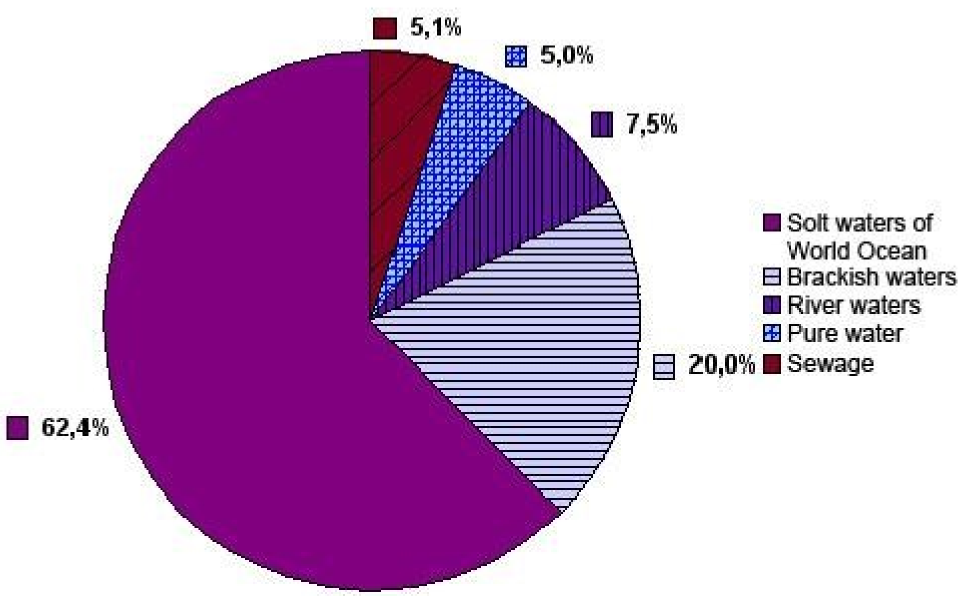


Fig.2 The structure of the application of technologies to produce fresh water

The structure of the application of technologies to produce fresh water, depending on the type of water resources

Fresh water consumption structure which is produced by industrial methods, is distributed
in the following way:

- municipalities - 66.2%
- industrial facilities - 23.5%
- energy facilities - 5.5%

- agriculture - 1.7%
- others - 3.1%.

Reverse osmosis technology is most demanded in the market.

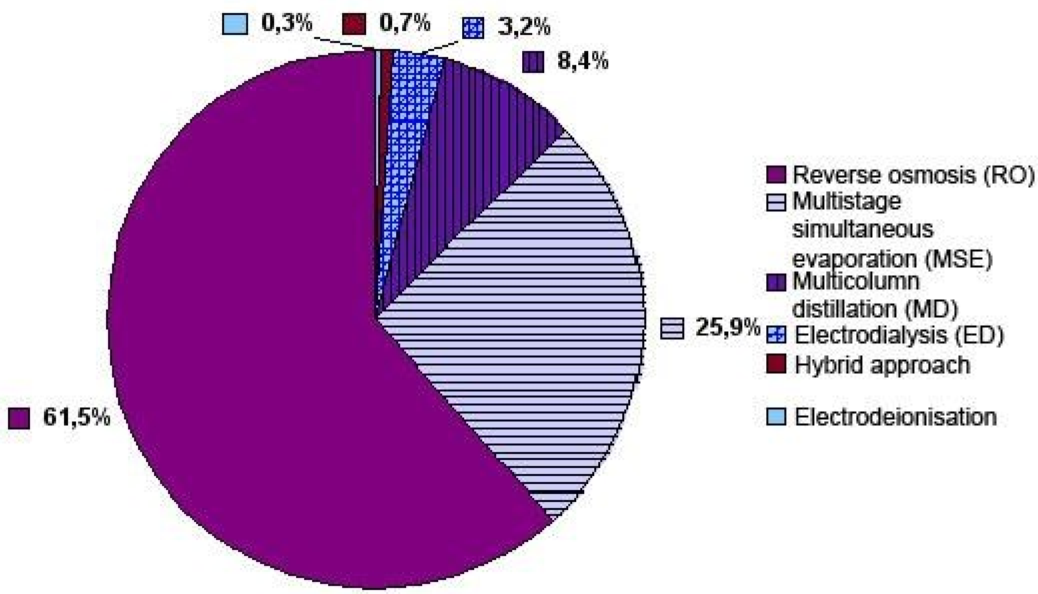


Fig.3 Structure of the production of fresh water by type of technology used

The most powerful desalination plants are in the Middle East. As example of major desalination system is Shoabia 3 (west coast of Saudi Arabia), producing 880 000 cubic meters. meters of fresh water a day. There are also 7 plants with capacity more than 400,000 cubic meters per day per each under construction in the region.

At the same time recent years it has become a tendency to expand the geographical scope of the seawater desalination market. The Middle East is still the largest consumer of freshwater from the World Ocean. However, large-scale program of state support stimulated technology demand in such areas as Algeria, Australia and Spain.

Table 2. The top 10 countries in terms of installed capacity for desalination of seawater in 2009

Region	Consolidated capacity, million m^3 per day	Share of the market, %
Saudi Arabia	7.4	20.6
United Arab Emirates	7.3	20.3
Spain	3.4	9.4
Kuwait	2.1	5.8
Quatar	1.4	3.9
Algeria	1.1	3.1
China	1.1	2.9
Libya	0.8	2.3
USA	0.8	2.2
Oman	0.8	2.2

Experts estimate that in the next 10 years, the seawater desalination technologies market will grow by 60% from current $10 billion to $16 billion in 2020. The main growth handler will become Algeria, Spain and Australia. In addition, the growth in demand is expected in China, India and the United States emerging markets. This equipment development market was greatly influenced by the introduction of reverse osmosis technology, whereby seawater is passed through organic membranes under 60 bar (~ atm.) pressure.

Traditional desalination plants which use evaporation technology are rather complex structures, because they should be aggregated with the CHP, which provides cheap

heat. This condition drop away in membrane plants, since they require only electricity and consist of easily assembled modules.

Development certificate on the market are the two major contracts which are made in autumn, 2001. The French company «Ondeo Degremont» received an order to construct one of the the world's largest desalination complex with annual capacity 62 million. m3 in the Emirate of Fujairah (UAE), costing 160 million. euro. Another French company - «Vivendi Environnement» will build a desalination plant with annual capacity 50 million. m3 and cost 1 million. euro near Tel Aviv (Israel).

Experts believe that in future the greatest demand for seawater desalination equipment will be noted in the Arabian Peninsula and North Africa (where 53% of all installed capacity), in the south of Europe, in the US states of Florida and California (17% of installed capacity).

According to specialists forecasts, in the period from 1999 till 2004-2005 investment in the construction of new desalination plants will be approximately $20 billion. So, Israel is going to lay down demand for plant with annual capacity 30 million. m3.

Construction of new major facilities are planned in the UAE and Singapore (annual capacity is up to 120 mln. M3).

Leaders of considered equipment market are 5 firms. First in the world in terms of turnover takes the French company «Vivendi Environnement». In 2000. annual sales of $ 1.135 billion. Euros, helped by the acquisition in 1998. French company «Sidem» and recently - American «US Filter». At this company accounts for 15% of the installed desalination in the world capacity.

Second place goes to «Ondeo Degremont» branch «Suez-Lyonnaise les Eaux», its turnover in 2000, amounted to 854 million. Euro. Followed by (in brackets - the turnover in millions. Euro): American firm «Lonics» (398) and two Spanish - «Pridesa» / in 2000. acquired a group of «Iberdrola» (84) / and «Cadaqua» (80).

Typical desalination plant

3. Problems and shortcomings of used technologies .

Shortage of fresh and clean water is felt in more than 40 countries located primarily way in arid and dried areas and about 60% of the surface of the earth sushi. This deficiency can be coated desalination salt (salinity of more than 10 g / l) brackish (2-10 g / l) of ocean, sea and groundwater reserves totaling 98% of the total water on the globe.

At a considerable distance freshwater sources desalination of salt water on the site is worth less fresh water coming through conduits. When water consumption up to 4000 m3 / day desalination of salt water on the site is more profitable than the supply of fresh water greater than 65 km; at water consumption of 11,000 m3 / day - more profitable than supply of fresh water at a distance greater than 160 km and 480 km with a water consumption of 200,000 m3 / day. Moreover, the state of current freshwater sources such that their expensive clean than to desalinate sea water.

Permanent shortage of usable water (primarily for drinking, food preparation, cultivation of food plants) and the constant danger of dehydration of human life and vodoёmkih species (industries) of the national economy causes increased concern about the Israeli public and has become a vital national social problem. To resolve this problem,
urgently find and implement ways and means to create and maintain a reliable system economically and ecologically acceptable additional water supply of the country. Search

for the optimal solution to the problem does not stop for a minute. Already published a number of competing proposals. Some of them even realized authorities and some economic entities.
The greatest progress made towards the establishment of additional
Water supply in Israel on the basis of seawater desalination. In Ashkelon already working in the first country desalination plant, which should produce 50 million. cubic meters of fresh water per year. The designing of the second unit to be built under the Hadera. Apologists of the ways of solving the problem of water supply in triumph reported that Israel will soon take first place in the world for desalination saturation units. Head of Planning Department of Water Resources in Israel, Dr. Yosef
Dreizin said it plans to create the country's desalination plants capacity from 450 to 800 cubic meters of desalinated water per year. The value of their structures expected in the range of from 400 to 900 million. USD, and operating costs can exceed 200 million. USD per year. However, objective evidence that desalination is allowed only as an auxiliary source of additional water supply, and the rate at it as a basic source of usable water
fatally flawed, since this source vysokozatraten is very limited and is suitable ecologically very dangerous.

Masterminds and perpetrators ideas to solve the problem of drinking water supply by Israel Desalination and the subsequent use of the water of the Mediterranean is very hard achieved its goal of turning into many departments to authoritative public and public figures, as well as teaching us through the media to inevitability drinking desalinated seawater. However, I could not find their publications, containing medical and environmental-cal characteristics of desalinated seawater and economic comparison of the processes of desalination of seawater by other means and additional water supply technologies in Israel. Therefore, I will try in some way make up for lost time with them.
At the present stage of scientific and technological development of mankind, there are three groups nepreodolënnyh harmful and even deadly health and environmental obstacles use of the waters of the seas and oceans to sustain the lives of people, animals and food plants - salinity of these waters, increased concentration of these "heavy water" and their pollution of products of the human community. In this expensiveness attempts to provide the population and economy of Israel "neutralized" saltwater much exceeds the cost of the use of other sources of water supply.

In an interview with the popular Israeli journalist Mark Gorin, published on June 12 2006 in the newspaper "The satellite of the North", the most famous and persistent advocate of "quench thirst "of the population and the economy of Israel by desalination of water Mediterranean Professor Yuri Kolodniy considered sufficient a single argument

in favor of the concept, consists in the fact that the oceans are concentrated 97% of the reserves of water on Earth (However, in another part of the same interview, Professor, apparently, that not noticing overthrew given them above argument, saying that humanity now uses only 0.7% explored the earth's fresh water, the one to which the consumption of "adapted" and people, and almost all other organisms living on Earth)

Modern Oceans occupies about 71% of the surface of our planet, and with the average 4 km depth contains 1.37 billion cubic kilometers of water, which is approximately 99.4 ... 99.6% of the known water resources of the Earth. The content of this huge water reservoir - A complex solution of numerous chemical compounds and elements, virtually inexhaustible store of chemical, biological, energetic and fuel resources Planet Earth. Of the 160 known chemical elements found in 70 sea and ocean waters. And Arthur C. Clarke, author of popular science books "The man who plowed the sea" believes that "any known element can be found in seawater" Each cubic kilometer of seawater dissolved, on average, 35 million. tons of solids, which gives seawater, freshwater unlike typical salinity. Salt masses of the seas and oceans form a salt, magnesium, sulfur, aluminum, copper, uranium, silver, gold, etc..

A significant part of substances salted sea and ocean water is useful for humanity, and in some cases it is cost-effective even their prey from the water of the seas and Oceans. Among them there are also harmful and dangerous substances. But in any case, as well known organisms adapted to the consumption of fresh water, can not eat salty seawater, reject such water. Desalination of seawater, or in other words, removal of salt masses it was an attempt to overcome this rejection. No other goals desalination process in its pure form is not intended and no other problems are not solved. Currently there are more than 30 ways to desalinate seawater, but even new modern industrial technologies do not provide complete desalination of large masses seawater, because of the variety of salts and a very high energy value (Energy intensity) desalination processes. Therefore, large quantities of desalinated sea water has low palatability and, often, visual quality, and often dangerous to health. This the result has not changed since then, as more than one hundred years ago, Russian writer and seascapes K.M.Stanyukovich in the acclaimed at the time the novel "Around the World on" Kite "(1895) wrote that going to sea, sailors carefully stocked with fresh water, "according to possible to avoid drinking ocean water. "

Another distinctive feature of the waters of the seas and oceans, preventing their participation (even after desalination) in the life of any organism is significantly increased

concentration compared them with fresh water stable heavy isotope of hydrogen (deuterium), oxygen (oxygen-17 and oxygen-18) and the heavy water - water, in which the lungs isotopes of hydrogen (protium) and / or oxygen (oxygen-16) are replaced with heavy isotopes. If a common fresh water contains about 0.015% of heavy water, in heavy sea water water is 0.020%.

Discovery and production of heavy water (1932) was an outstanding scientific and technological achievement of mankind, caused an outburst of research and major new discoveries. Soon it was found that heavy water - it is an ideal fuel for thermonuclear processes stocks in the seas and oceans are practically inexhaustible.
It is used as a neutron moderator and coolant in nuclear reactors, for obtaining deuterons in particle accelerators, in magnetic resonance spectroscopy, etc. At the However, it was found that fish, worms and bacteria can not exist in the heavy water, and the animals are dying of thirst, if they drink heavy water. Not germinate in the heavy water and seeds.

The fact that the body - this delicately balanced set of chemical reactions, heavy water changes the speed of some of them i.tem violates the balance between various reactions. Ions of deuterium and heavy water is much less mobile than ions of protium and ordinary water. This leads to many violations of normal vital activity: Inhibition of biochemical and physiological processes reactions, changes in the nature of the action of pharmacological agents, inhibition processes of muscle contraction, changes in resistance with respect to some external physical factors - to the hydrostatic pressure, temperature, and others. And since deuterium easily replaces protium, in particular DNA and RNA molecules, may cause genetic changes in cell division, as well as deuterium considerably less mobile than against, the first thing will stop the oxidation and reduction reactions.
Of course, one-time or occasional use of heavy water will not cause visible changes state of the organism, as it is chemically similar to a conventional, water protium and by a few hours or days deuterium trapped in the body will be completely removed therefrom. However, if hard water is often absorbed into the body (namely, this will occur when water supply desalinated sea water) against the body will gradually be replaced
deuterium, and there will be described in the preceding paragraph, the destruction of the body. Experiments in mammals showed that the replacement of 25% of hydrogen (protium) in their tissues deuterium leads to sterility animals, while a higher content in deuterium body animals perish.
From the above clarification is quite evident in the inadmissibility of the use of processes,
associated with the life of humans and other organisms even desalinated sea water,

if they are not removed from the heavy water.

Thus, both of the above options recycling virtually inexhaustible stocks in seawater as a raw material for fusion fuel and for water safety require the same treatment of the water: separation of heavy water from the light (protium). There are currently several ways to select heavy water. The most effective of them - electrolysis, isotopic exchange, burning obogaschën- tion deuterium hydrogen. However, the isolation (separation) significant (Industrial) amounts of heavy water in any of these ways is the most complicated scientific and technical task that requires enormous amount of energy and finance. Thus, for Branch 1 ton of heavy water to be processed at a very complex and secret Technology 40 tons of seawater while expending 60 million kWh electricity. It is not surprising, therefore, that only nine countries in the world are able to be isolated from the usual minimum required water for industrial purposes the amount of heavy water, with
the ninth, a country defined literally these days - in the last decade of August 2006. This country, as we know - Iran, which is regarded as an outstanding achievement of their historic scientific and technical, economic, and military and political victory. From the above it is clear that in the foreseeable future can not count on clean desalination of seawater from the heavy (and deadly) isotopes of hydrogen and oxygen. This cleaning can be carried out only after the opening of the new, more cost-effective ways of its execution or after the spread of industrial processes obtain enriched deuterium for energy, a byproduct of which will be sea water, purified from the heavy isotopes. Means offering and implementing desalination seawater today, we want to force to drink water containing heavy isotopes of hydrogen and oxygen.

The third fatal dangerous obstacle for water and population Israel's economy (as, indeed, and other countries) is desalinated seawater pollution of the seas and oceans. Water seas and oceans contains enormous reserves of gold, iron, uranium and other chemical elements. At the bottom of their countless hidden mineral deposits. Oceans and seas - a rich source of plant and animal nutrients essential for a person and now and in the future. But now the waters around them is used as a dump, as the cheap and common method of disposal of industrial and domestic waste. In the sea oceans and reset the mass of organic waste or inadequately treated, if any, not treated, turning the waters in these hotbeds of disease-causing viruses (Dysentery, cholera and others.). As a result of the discharge of untreated and poorly treated industrial and commercial wastewater into the oceans every year gets about 100 thousand tons of waste. Pollute the seas and oceans as oil and combustible gas: 30% of the world production is currently produced from offshore wells, and moreover, in the sea oil flow in case of accidents Su Dov, washing fuel tanks and others. Companies dumped into the sea and

oceans mercury, chromium, zinc, lead, etc. Continues burial at sea radioactive waste from nuclear reactors, chemical weapons and other toxic substances.
Found that metal containers in which they are enclosed, are destroyed in the sea water, on average, after 10 years, concrete - 30. Content of destroyed containers are washed and into seawater. Admission to seawater radioactive substances occurs continuously over a long time. Thus, starting with 1991, continuously indicates flow into the sea water cesium-137 and other radionuclides.
Starting from the 70s of the 20th century, it has already become an alarming threat to the seas and oceans and is constantly increasing, caused by the ever-increasing penetration into them from any nuclear businesses and long-lived radioactive isotopes NPP plutonium and uranium.
But a particular threat to all living creatures is the third, superheavy hydrogen isotope - tritium. Tritium is not there all the time. He is an intermediate radioactive nuclear reaction products, and although not a problem from the standpoint of long-term burial of radioactive waste (half-life - 12.3 years), it is very dangerous for human. It can get into the human body through the skin, as a result of inhalation or water. Unpleasant feature of tritium is its mobility. He spreads quickly with air or water streams. If deuterium kills slowly, the tritium - immediately. It can not be drink, they can not wash, you can not breathe its vapors.
All of the above and many other contaminants present in the waters of the oceans.
Mediterranean Sea, is recognized as one of the most polluted areas of the oceans, actively contaminating other parts. This is understandable: the Mediterranean coast and close intensely populated, its waters and bottom long been ruthlessly and actually uncontrollably operated and clogged. One can easily imagine how disastrous for human water of the sea, even desalinated.

To date, humanity has managed to survive the period of faith in the solution water desalination using the waters of the seas and oceans and the subsequent disappointment. Industrial desalination plants have been established and operated in many scattered all over the world countries and regions experiencing water scarcity - for Canary Islands, in Tunisia, in England, on the island of Aruba in the Caribbean, Cuba, Venezuela, in California, on the islands of the Indian Ocean, in the north-western part of Black Sea and Azov Sea coast in Ukraine, in the city of Turkmenbashi (formerly Krasnovodsk), and others. But very soon appeared the above organic defects of desalinated water water. On the one hand, the high cost of desalinated water (and hence of this product) due to a very large energy content desalination for which is recommended even to use nuclear energy. On the other hand, desalinated water, as would be expected, turned out to be deadly to humans, animals and plants.
In this regard, it is appropriate to recall the tragic events of 70-ies of the last century.

On the peninsula Mangyshlak (Caspian Sea, Kazakhstan) In 1973 there were built nuclear power and powerful desalination plant to supply electricity and, most importantly,
water for the residents and the economy of the new city Shevchenko (now called Aktau).

People use this water for drinking, food, watering food plants and watered her home animals. Soon sanitary inspection has sounded the alarm: in steep increase in the number cancer and occurrences of stillborn children. Below is shows that after these events, the Republic of Kazakhstan is no longer considering desalination seawater among his sources of water supply.
However, according to information released by the director of the research group "Project global policy in the field of water resources", a senior fellow at the Institute Worldwatch ("Worldwatch") Sandra Postel, desalination waters of seas and oceans as a way to water never enjoyed notable popularity, and now desalinated water is only 0.2% of the global water consumption, and half of all plants for desalination of seawater is in the Persian Gulf.

All modern developed and developing countries, recognizing the importance of preserving the gene pool their peoples. allow the use of already existing in their territories desalination installation only for technical and economic needs, excluding ingress
desalinated water inside living organisms. This statement applies to all without exclusion of the Mediterranean countries and the Persian Gulf, where, as noted above, there are more than 50% of desalination plants available in the world. Malta, Qatar, United Emirates, were completely absent its sources of freshwater and running water flowing desalinated seawater, the latter is used only for business and technical needs, and drinking water and food are imported from abroad and sold in bottles and / or spill; the same goes with desalinated water, and Saudi Arabia, which imports drinking water from New Zealand, and fruits and vegetables - from Australia.
The situation with fresh water in Israel is significantly different from that which prevailed in discussed in the preceding paragraph anhydrous countries. Israel has a large enough supply of fresh water in the Sea of Galilee and small rivers, underground sources and aquifers, and it is this water flows now in its water supply system. Under these conditions, only three real options inclusion of desalination plants in water infrastructure in Israel:
1) the inlet of seawater into desalinated water and Israel, therefore, its mixing with Fresh water
2) the construction of a second water supply especially for desalinated seawater and

3) Exemption from existing water supply of fresh water and its use for desalinated sea water with the sale of fresh drinking water in bottles or in bulk, as in states do not have their fresh water (see. above). In all three versions of the tap water is much more expensive (because of the high cost of desalination, in the second embodiment, moreover, because of the cost to the second water pipe) and wherein become undrinkable both in content and taste, and the usual fresh (potable) water will turn into a delicacy, are difficult for the weak segments of the population. It is appropriate here Note that the data presented by Professor Y. Kolodniy in the newspaper "News" on July 2005 (article "In Search of address"), the cost of 1 cubic meter of water desalinated in Ashkelon desalination plant was 37 cents, which is about 3.5 times higher than the cost rainwater harvesting systems.

Environmental risks

Environmentalists continue to speak out against the process of desalination, arguing that it harms environment.
Removal of salt from seawater leads to the formation of the concentrated slurry so-called brine which is twice as heavy salt water contains contaminants that may affect the marine life if discharged back into the sea. In the case of the removal of the brine on land, it can seep through the soil, getting into the groundwater. Office for Environmental Protection in the United States found that a huge the number of constructed desalination plants for processing of seawater per year harmed about 3.4 billions of fish and other marine fauna and brought losses to the fishing industry of the country in the amount of 212.5 million. dollars. Desalination plants also can destroy about 90% of the plankton.
In addition, desalination plants emit a huge amount of carbon dioxide emissions, as fossil fuels.
Research organization for the protection of the coast in San Diego, has estimated that the plant daily producing about 53 million. gallons of water will consume twice the amount of water for her recycling and reuse.
The situation seems rather ironic, since the creation of such desalination plants sea water - this would seem to address the shortage of drinking water and a way out crisis, but experts say that it can only create more serious environmental problem such as climate change on the planet.

Impact on health

The use of desalinated water also causes some conflicting opinions regarding desalination process impact on health.

According to the chairman of the Institute of Development Studies and Environmental Safety Pacific Environment Peter Gleick, reverse osmosis membranes can remove only 50% of boron, which is included in the chemical composition of seawater. Excess boron can cause problems in the reproductive system of both humans and animals, but also lead to a violation of the gastrointestinal tract.

The main disadvantages of the existing desalination systems:
1. The struggle against deposits (eg, scale) on heat exchange surfaces, membranes and so on;
2. high specific energy consumption;
3. The presence of a large number of replacement materials, components, chemical reagents additional cost;
4. environmental hazard during the use of facilities;
5. The need for highly qualified personnel.

Specifically, when water is desalinated by distillation in evaporators which is fed by saltwater of seas or oceans, serious difficulties causes rapid overgrowth scum heat transfer surfaces. It is due to the high stiffness, usually peculiar to natural waters.
Scale formation on the evaporator heat transfer surfaces leads to a dramatic reduction in their effectiveness, the necessity of frequent shutdown and cleaning of evaporators use
antiscale, chemicals, which is associated with high operating costs. The main thing is to initial water special requirements that may be provided using expensive water treatment systems.
The problem of providing sufficient energy (heat) of large desalination systems.
Need powerful boiler (CHP) or nuclear reactors. The cost of heat - 40-50% of the cost desalination by distillation. A lot of money spent to solve environmental problems and maintenance of such systems.
Attention is drawn to the high cost of operating costs by using reverse osmosis and electrodialysis (membrane) methods.
Experience with similar installations around the world shows that the downward trend cost of operation is observed, which is explained by the desire of consumers to see stable work directly desalination plants and their automation.
In this regard, the level of pre-treatment becomes one of the dominant aspects of these desalination methods, and the cost is significantly higher pretreatment sometimes the facilities themselves.

Water supplied to the membrane (for salt content of 40 g / l) pressure of 50-150 atm. shall contain:
1. least 0.56 mg / l of suspended solids;
2. less than 2-3 mg / l colloidal contaminants;
3. The free chlorine is less than 0.1 mg / l for the composite membranes of polyamide, and at least 0.6-1.0 mg / l
for cellulose acetate membranes;
4. The oil-soluble salts (iron, calcium, magnesium, strontium) at concentrations that do not cause their
deposition on the membranes;
5. microbiological contamination should be absent;
6. Water supply temperature must not exceed 35-45 ° C;
7. The pH of the source water should be between 3,5-7,2 for cellulose acetate membranes and 2,5
11.0 - for polyamide.

To ensure that these requirements needed to provide clean water before it is fed into the
membrane installation.

It includes:
1. The removal of sediment (presented to the input mikrofilter cartridge ammunition having pores 5 um or less);
2. removal of metals (e.g., iron removal);
3. Remove the active chlorine;
4. The water softening or use of inhibitors;
5. disinfection, washing and sanitizing membranes.

All of these factors are often ignored by companies selling reverse osmosis.
The high sensitivity of membranes to various kinds of impurities of organic and inorganic
character requires circuits developed in reverse osmosis. And for reverse osmosis and electrodialysis most dangerous are hardness salts, especially calcium hardness. Eradication of organic contaminants is achieved, e.g., by use of hypochlorite, activated carbon, biological treatment of water or electric destruction. To reduce the content of calcium salts there are no effective methods. For brackish water use processing or softening agents. Electrochemical processing increases the cost desalting, and the question of its use is decided in each case.

Marine (ocean) water with a total hardness up to 140 mEq / kg effective methods softening does not exist at all. Therefore, engineers must come to terms with the idea that all or most of the burden associated with the deposition of salts, membranes assume.
For installations desalination reverse osmosis requires a complex system of preliminary cleaning excess cost sometimes 2-3 times the cost of the reverse osmosis, and power consumption is doubled, and the maximum lifetime of membranes 0,5 1 year and regeneration. They can not be required special solutions for storage and temperature control storage.

The table below shows a comparison of the estimated desalination methods on three levels: minimum (Min.) And maximum (Max.) And average (Avg.).

parameter	ion exchange	reverse osmosis	electrodialysis	evaporation
reliability	maximum	average	minimum	maximum
desalting degree	maximum	average	minimum	average
organic fertili-zer removal	minimum	maximum	minimum	average
microflora removal	minimum	maximum	average	maximum
dredge removal	minimum	maximum	minimum	maximum
solute gas removal	minimum	minimum	minimum	maximum
preconditioning requirements	minimum	maximum	maximum	average
power inputs	minimum	maximum	maximum	maximum
consumption of reagents	maximum	minimum	minimum	minimum
consumption of water supply	minimum	maximum	maximum	minimum
waste volume	minimum	maximum	average	minimum
waste	maximum	minimum	minimum	maximum

converting possibility				
waste discharge possibility	minimum	maximum	average	minimum

For reference, the composition of seawater

The composition of seawater

(Quick reference to chemistry. Goronovsky IT, Nazarenko YP, Nekryach EF 1965 str.513)

(average composition in wt.%)

O 86,82	Ca 0,041	F 0,0001	Zn 5×10^{-6}
H 10,72	K 0,038	Si 0,00005	Ba 5×10^{-6}
Cl 1,89	Br 0,0065	Rb 0,00002	Fe 5×10^{-6}
Na 1,06	C 0,002	Li 0,000015	Cu 2×10^{-6}
Mg 0,14	Sr 0,0013	N 1×10^{-5}	As $1{,}5\times10^{-6}$
S 0,088	B 0,00045	I 5×10^{-6}	P 5×10^{-6}
Al$<1\times10^{-3}$	Pв 5×10^{-7}	V 5×10^{-8}	Ga 5×10^{-8}
Mn 4×10^{-7}	Se 4×10^{-7}	Th 4×10^{-8}	V 3×10^{-8}
Ni 3×10^{-7}	Sn 3×10^{-7}	La 3×10^{-8}	Ce 3×10^{-8}
Cs 2×10^{-7}	U 2×10^{-7}	Bi$<2\times10^{-8}$	Sc 4×10^{-9}
Co 1×10^{-7}	Mo 1×10^{-7}	Hg 3×10^{-9}	Ag 4×10^{-9}
Ti$<1\times10^{-7}$	Ge$<1\times10^{-7}$	Au 4×10^{-10}	Ra 1×10^{-14}

Natural water containing up to 0.1% referred to the fresh solute from 0.1 to 5% - mineralized, more than 5% - brine.
It includes the main components of natural water ions Na^+, K^+, Ca^{2+}, Mg^{2+}, H^+, Cl^-, HCO_3^-, Co_3^{2-}, SO_4^{2-} and gases O_2, CO_2, H_2S.
It also contains small amounts of Fe^{2+}, Fe^{3+}, Mn^{2+}, Br^-, I^-, F^-, BO_2^-, HPO_4^{2-}, SO_3^{2-}, HSO_4^-, $S_2O_3^{2-}$, HS^-, $HSiO_3^-$, H_2SO_3 and gases N_2, CH_4, He.

Other substances in water are in extremely diffuse state.
Water intended for drinking and household needs of the population, as well as for utility enterprises and food industry, must meet the requirements
requirements for water supplied to the consumer (ГОСТ 2874-54).

4. The technologies used in the world.

World technologies for desalination of seawater are the following:
1) MSF (Multi-Stage Flash Distillation), desalination method by which evaporated seawater by order through many chambers where the pressure gradually decreases.
2) MD (Membrane Distillation), heated sea water on one side of a hydrophobic membrane, which passes steam but does not pass water, and on the other hand cool the steam and missed get fresh water.
3) MED (Multi-Effect Distillation), heated to a high temperature (effectively) seawater in the first and using the column formed in the first vessel to heat the steam in the subsequent columns.
4) MVC (Mechanical Vapor Compression), for heating the sea water in the first column by the method MEO use partially pressurized steam. In comparison with the methods of the MKS and MO less power consumption and has an advantage: it is possible reduce the maximum temperature of the sea water.
5) FP (Freezing Process) to crystallize only the moisture content by cooling sea water, isolated and crystals dissolve to produce water.
6) RO (Reverse Osmosis), using a semipermeable membrane that has the ability to: water penetrates, but ions and molecules of impurities do not penetrate. Get fresh water through the semipermeable membrane may pressure seawater large osmotic pressure solution.
7) ED (Electrodialysis), alternately establish a membrane that passes only the cation, and a membrane that passes only the anion and include a DC voltage therebetween, and
cleaning, for example, sodium, and chlorine anion from seawater.

Thus, industrial desalination is performed by one of the following:
methods: distillation, reverse osmosis, electrodialysis, ion exchange, and freezing. Of all volume produced in the world of desalinated water 71.5% accounted for by distillation desalination plants, 19% - reverse osmosis, electrodialysis, 9.4%, 0.1% - on a share freezing of ion-exchange and so on desalination (as of 1991).
According to experts, each of the designated technology has significant drawbacks, among
which are:

- considerable deposits on heat exchange surfaces, membranes, etc.
- high specific energy consumption
- the presence of a large number of replacement materials, components, additional cost
  chemicals
- environmental hazard in the operation of facilities

- the need for highly qualified personnel.

In this regard, the question remains the development of more efficient and environmentally friendly
methods for seawater desalination.

5. Recent developments in desalination

Hydrowave method.

The new technology of cleaning and desalination company STC "TEROS-MIFI" (www.teros-mifi.ru) based on application were not previously used in this area of the physical processes which are based lies in the seawater creating hydrodynamic regimes such combined exposure
electromagnetic field that creates a saline chemical and thermal conditions, facilitating vaporization of water is much greater than in known cases.

Installation company STC "TEROS-MIFI" Russia, Moscow
The unit has no filters, sorbents, ion exchange resins, chemicals.
The cost of 1 ton of produced fresh water from sea no more than $ 0.3.
Specific energy consumption is less than for known plants with the same purpose.
Ensure environmental security, the possibility of isolating the salts in the form of a solid precipitate.
To create a large desalination complexes (~ 10,000 m3 / day or more)
it is advisable to use modules (~ 50 m3 / h 1200 m3 / day). Possible to use a large modules.

6. The problems facing developers.

The developers had put several tasks:
5.1. Create a seawater desalination technology, including pickles, and at the same time one unit pre-treated wastewater effluent and industrial
housing and communal origin.
Also improve the quality of drinking water.
5.2. Expenses for desalination of 1 cub. m. of water should not exceed 0.1 $.
5.3. Performance Position should be in the range of from 1 to 4 m 3 per minute, or 60 - 240 m3 per hour
5.4. In operation of the plant must not contain filters, sorbents, ion exchange resins, chemicals.
5.5. Machine weight (working unit) must not exceed 700 kg.
5.6. Installation must be adapted for use on mobile installations.

Initially, the basis for the development of the installation have been taken in the field of Nikola Tesla hydrodynamics and disc pumps

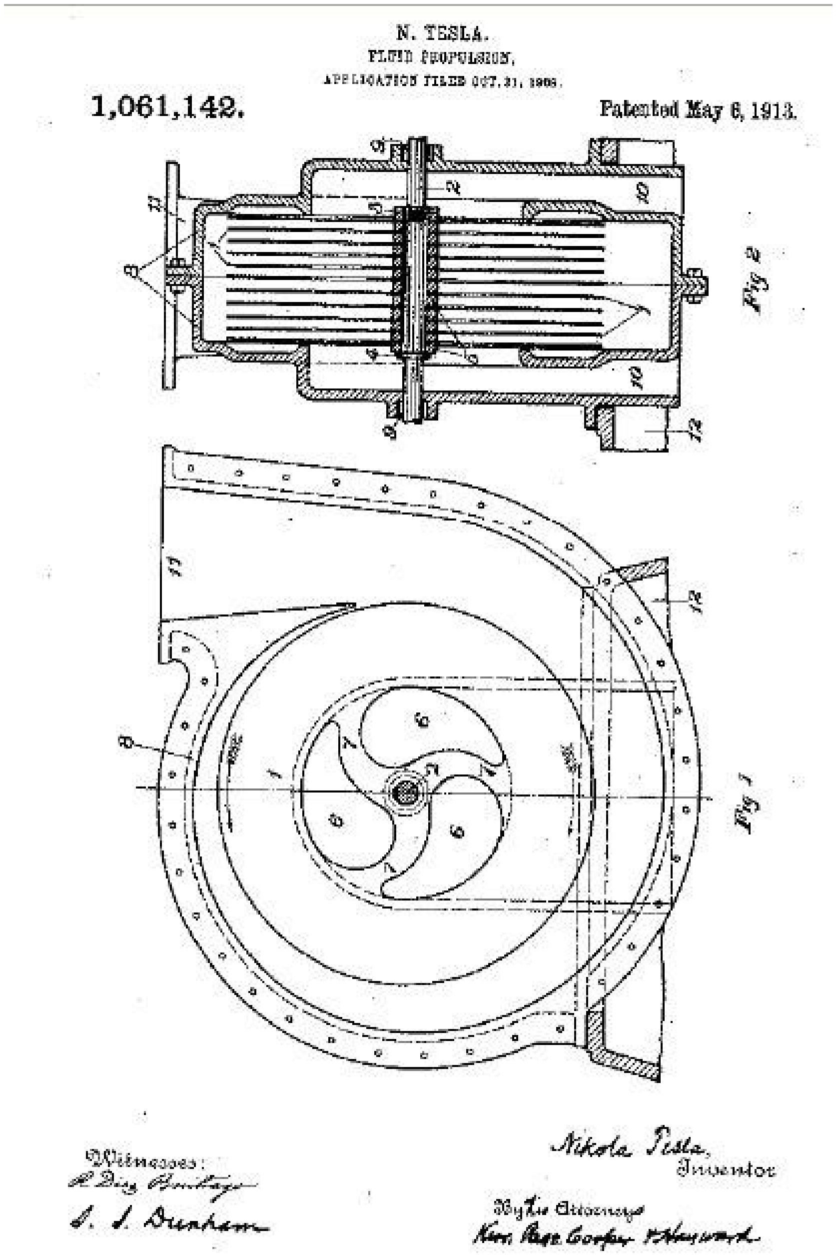


Figure disc pump of the patent Tesla

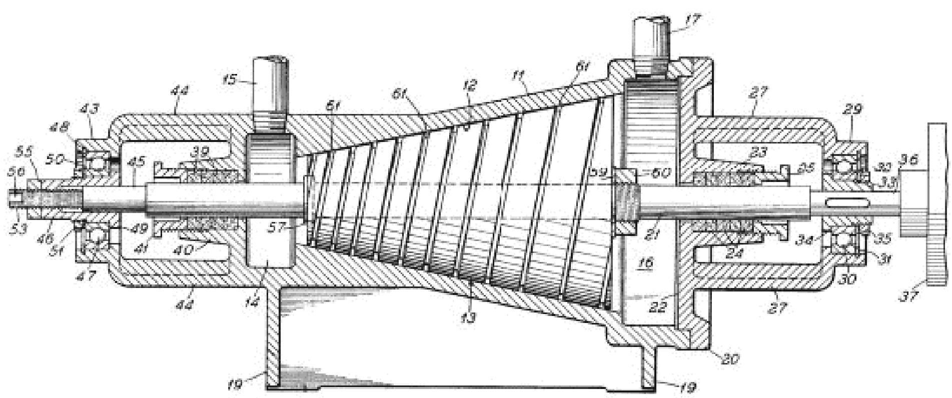
Task was to construct such a device, so that it retains all the advantages disc pump:
A) high resource entire system, defined only by bearing assemblies and seals
B) the ability to pump all of the existing liquid fractions
C) Low wear disc

Currently, such pumps only produces firm world Discflo Corp. (www.diskflo.com)

Photo: Example of disk pump of company Discflo Corp.

Pumps of this company are used by pumping abrasive mixtures of various chemical active liquids to transfer live fish.

The second basis for the project was the development of Richard Clem, its engine



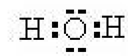
- Truncated Conical Drag Pump -

A local resident of Dallas developed the engine gated, which allegedly produces power 350 horsepower and runs by itself.

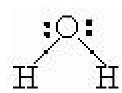
The engine weighs about 200 pounds (reference: 1 pound = 0,45359237kg) and contains vegetable oil with a temperature of 300 F (150 C).
Inside the cone engine is mounted on a horizontal axis. A shaft on which fortified cone and goes inside the empty coil in the hollow channels inside the cone. They wrap around the cone and ending at the base nozzles (nozzles).

These two developments have been fundamental in the selection principle and scheme of work of our future installation. Next, it was necessary to create the conditions for the process of water purification.

Help.
The water molecule has the following electronic structure:



Two pairs of electronic form polar covalent bonds between atoms of hydrogen and oxygen, and
the remaining two electron pairs remain free and are called lone. The water molecule has an angular structure, the angle of the H-O-H is 104.5 degrees.



The presence of H2O molecules in the unshared electron pairs of the oxygen atoms and positively
charged hydrogen atoms leads to very specific interactions between molecules, called hydrogen bonds. In contrast to all the familiar types of chemical bonds this relationship - intermolecular.
Due to the fact that the water molecule has a polarity less zone advantage in oxygen and
the field of hydrogen, faced with the task of strict orientation of the structure of water in the working area.
In parallel, there was a problem prior destruction of the cluster structure of water as namely clusters, combining usually from 55 water molecules and contribute to the inclusion in
composition of water impurities. This problem is successfully solved as soon as we have applied design vacuum zone.

In parallel, it was discovered that the water molecule in this process is strictly guided oxygen to a high pressure zone, and a hydrogen dilution zone (conventionally we call these
zone vacuum).
Simultaneously, it was necessary to create shear conditions throughout the molecular structure of water so to change its energy state, solubility, and other parameters. At the same time we working on the angle of interaction of oxygen and hydrogen in a water molecule, rather than
covalent bond, that in our case in principle. Since these bonds characterized high strength, and to influence them only extra-large effort. In this case limited by the shear forces, does not exceed 1,000 kN.

This was to be done to the water began to displace themselves from impurities contained in the
it. (The processes are very close to the freezing process of water when displaced from it all impurities including a "heavy" and "light" water).
Once this process is carried out in practice, freezing for a few hours, and in our case, everything happens in a fraction of microseconds.

Work carried out on salted water for various reasons. The output is a net flakes with water insoluble impurities which are easily filtered by the simplest filters. In operation was made a few prototypes. Photographs plants are presented below.

I must say that in the process, developers inserted more than 10 know-how and despite the apparent simplicity of installation, it would be very difficult for unscrupulous manufacturers to repeat it.
Work was carried out in the direction of heat producing. But in the process revealed that the installation work fine as desalination. Moreover, it turned out, that in most cases do not require evaporation cycle, the impurities out of the water started to flaked already at temperatures around 50 degrees Celsius. But in this case the transfer of water the vapor phase is more economical, but also to the mode value of vaporization desalination below the best examples of dozens of times. In the pair of the cost of desalination depends only from deadlines depreciation of the plant itself, staff salaries and fixed assets.

In parallel, work was carried out on another device for domestic use, which showed similar results in terms of output water impurities. In these tests, in Kharkov, Ukraine, all the tests, after the installation there is a strong smell of chlorine, Kharkov Vodokanal used to disinfect drinking water. Due to the fact that chloro initially contained in water as the compounds isolated as a gas, could conclude that there is a division of chlorinated reactants into individual elements. B Water passed through the installation flakes displaced inclusions observed, as well as on the "Ennio - 3".

Unfortunately, the results of the work, the developers do not have a formal protocol testing under the terms of the contract with the customer.

The result of 10 years of work was the of "Ennio - 3" plant.

The result is a system that can work with all kinds of liquids, sewage industrial enterprises and housing and communal services, sea water, pickles and so on.

7. The proposed technology and installation

Tasks have been successfully resolved. During the period from 1998 to the present time, it has been manufactured in series three experimental setup different designs. Developers have accumulated wide experience in designing this kind of facilities. But so far have not had
adequate funding for full-scale work on finishing up the installation industrial before status.

Structurally the installation consists of a rotor disc or variations, which rotates with the high speed special design of the stator.

Technology has no analogues in the world according to the method of desalination. The principle of interaction water vacuum created in the installation by the trajectory of movement of water. Resulting in water molecules and deformation of its energy state from its structure, all the impurities are forced out, in fact, we can say that we have to shake with the structure of water impurities, not only with the is a restoration of the normal structure of the water. Can with great certainty assume that in this type of

machine will be destroyed and heavy water. Simultaneously, due to powerful electromagnetic effects on the impurity they are transferred to an insoluble phase.

As a result, impurities are easily separated from the clean water. In this case, all the processes taking place in one pass, without any cost reagents and exposure to electromagnetic energy.

The result is a setting "Ennio - 3", which works in two modes - desalination through electrolysis and the hydrodynamic mode and evaporation. In the first case, one desalination cost = $ 0.02 m3
In the second no more than $ 0,002.
The cost price of desalination is reduced relative to the best analogues in 15 - 30 times in the first mode and several orders of magnitude in the latter.
Drive power: 22 kW
Water productiveness 3 cub. meters per minute. Or 180 per hour.
Weight without piping and control board 350 kg.
In some modes, the installation is able to generate electrical energy, which can be send for processing received salts.
From one ton of sea water can be recovered from 30 to 50 kg of salts which include valuable
elements of the periodic table.

The cost price of desalination complex is maximum $ 250,000
Minimum market volume: 10 000 000 000.00 $
Estimated market volume: 18 000 000 000.00 $

At present developers have improved plant project codenamed "Ennio - 4" which has more improved and easy design. More technological and light to operate with. However, to date resource setting to limit the resources mainly bearings. B Currently there development and practical model of a new kind of bearings with up to
30. The use of new materials and components will create a system that can
work without major repairs for a long time.

8. Working Group.

Major developers and patent holders: 3 man.

9. Costs

The total cost of the entire development period is about 2.3 million $.

Among them:
Direct costs for equipment --- 1700 $ 000.00
Design work, including designers wage, computers, software, consumables, etc.--- 120 000.00 $
Travel expenses, communications, transportation --- 80 000.00 $
Wages of developers and other professionals --- 400 000.00 $
Project leader: Siarg A. V.
Progres1000@gmail.com